October 1996
Revision H

CLARIFICATION ADDENDUM

TO

PERFORMANCE ASSURANCE REQUIREMENTS

FOR THE NOAA-K, L, & M

ADVANCED VERY HIGH RESOLUTION RADIOMETER

AND

HIGH RESOLUTION INFRARED RADIATION SOUNDER

AVHRR/3 AND HIRS/3

S-480-29.1

September 1996
Revision H

PERFORMANCE ASSURANCE REQUIREMENTS

FOR THE

NOAA-K/L/M

ADVANCED VERY HIGH RESOLUTION RADIOMETER/3 (AVHRR/3)

AND

HIGH RESOLUTION INFRARED RADIATION SOUNDER/3 (HIRS/3)

Approved by:

Original signed *10/8/96*

William E. Daney
POES Flight Assurance Manager
Date

Original signed *10/8/96*

Douglas Fineberg
POES Instrument Manager
Date

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland

CLARIFICATION ADDENDUM

GENERAL

The intent of GSFC-S-480-29 Performance Assurance Requirements document (PAR) is to provide a standard set of requirements for the AVHRR/3 and HIRS/3 polar orbiting type instruments. Since each supplier has their own unique style of operation; specific clarification of some requirements has become necessary. The original version of this addendum which was released in September 1987 as an answer to an ITT letter (dated August 31, 1987) which requested clarification of the PAR. A subsequent version was released in September 1988 as a result of the August 1988 contract negotiations. Revision C (March 1989) of the addendum was not released to ITT. Instead Revision D, without items 25 and 26 from Revision C, was submitted to ITT with no cost impact to the contract. Revision E was never submitted to ITT. Revision F was created to change the wording of items 25 and 26 again by deleting their text again and inserting "To be negotiated at a later date". The Revision (G) has been created to incorporate the final wording into items 25 and 26. The Revision (H) has been created to incorporate the final wording into section 5, and Appendices A and C (see item 37).

ITEM:

1. Regarding page 1-3, paragraph 1.6, it is Metsat's intention that A/OD continue working with NASA and DCAS inspection personnel.

2. Cost control requirements mandate obtaining goods and services from the low bidder among those qualified. Paragraph 1.7.1 indicates that quality considerations are pertinent to being qualified.

3. Page 1-5, paragraph 1.13 applies only to hardware qualified and flown for other than previous AVHRR or HIRS programs.

4. With reference to page 2-1, paragraph 2.3c, as on the NOAA- H, I and J Program, GSFC intends to conduct the Pre-Ship Review at ITT for the first AVHRR and HIRS instruments.
   The remaining Pre-Ship Reviews will be conducted by phone.

5. Regarding page 2-2, paragraph 2.4, for purposes of this contract, the requirements in paragraph 2.4 shall be met when the requirements cited in item #12 below are satisfied.

6. Regarding page 3-1, paragraph 3.1.1, for purposes of this contract the requirements in paragraph 3.1.1 shall be met when the requirements cited in item #12 below are satisfied.

6a. With respect to paragraph 3.2.1, the Schedule of Submission of Verification Plan should be changed to:

a. Initial - 4 months after contract award
b. Baseline - 2 months before CDR
c. Update - At CDR

7. With reference to paragraph 3.2.2, "Verification Specification," existing documentation developed by ITT that contains the information cited in this paragraph should be updated to incorporate any changes resulting from new or modified environmental requirements.

8. Page 3-3, paragraph 3.2.4. For the purposes of this contract, the verification reports cited shall consist of the final instrument level acceptance test report only.

9. The length of time required for consideration in defining limited life items is ten (10) years.

9a. With reference to paragraph 3.3.2.3, and item 9 of this addendum, the contractor will conduct a life-test program on those electrical parts determined by the contractor as having a limited lifetime, (less than 10 years), with the exception of the HgCdTe detector device, which is presently known to have limited life. GSFC does not wish the contractor to embark on an expensive developmental program to meet time-associated guaranteed performance. GSFC acknowledges that recalibration and possibly replacement of this detector may be required within the five-year storage lifetime listed in the specification, and will authorize this activity under a separate contract.

9b. With reference to paragraph 3.4.3.1, no separate structural load tests, either Dynamic or Static, are required, other than those performed as part of the system sinusoidal and random level testing.

10. Table 3-1 "Structural and Mechanical Requirements": In reference to acoustical requirements, the tests must be performed if indicated by analysis or other considerations. If the design remains unchanged, acoustics testing is not required.

10a. With reference to paragraph 3.4.5.1, no analysis or tests are required related to internal shock producing elements, as long as no changes are made to the present proven design which would introduce new shock producing elements.

10b. With reference to paragraphs 3.4.6.1 and 2, no new Kinematic Analyses are required for this contract, since no new mechanical operation is involved. Normal acceptance level mechanical function tests are required.

10c. With reference to paragraph 3.4.7.1, no Pressure Profile Analysis or Test is required on this contract for either instrument because no changes have been made to the proven designs which would require this type of analysis or test.

10d. With respect to paragraph 3.4.8, no Mass Properties Test is required on this contract for either instrument other than the measurements of size, weight, center of gravity, etc., performed in the same manner as they were performed as part of the acceptance testing on previous-design units, viz. HIRS/2
and AVHRR/2.

11. Regarding Paragraph 3.6, regeneration of detailed thermal analysis is not required if it can be shown that instrument changes which impact thermal control are minimal; i.e., the instrument thermal design remains within specification.

12. ITT will meet the requirements cited in Section 4 for the purposes of this contract by:

    a. Submitting an updated version of the industrial safety plan previously submitted and,

    b. Providing a letter certifying that the AVHRR/3 and HIRS/3 instruments do not contain: radioactive sources, pressurized vessels, ionizing and non-ionizing radiation sources, toxic materials, pyrotechnic devices, explosive charges or electrical grounding provisions other than those that are connected to the spacecraft grounds.

    c. If Hazards do exist, the requirements of section 4 will be followed.

13. In general, with regard to Section 5, GSFC approves procuring a part previously bought to a Code 311-approved ITT NOAA-H/I/J NSPAR provided that paragraph 5.2.2.1 of the PAR is met. Additionally, if the part is now available as a Grade 1 part, it may be purchased as such.

14. Regarding page 5-1, paragraphs 5.2.1 and 5.2.4, the parts

requirements are now defined in document MIL-STD-975G. Appendix A, Section 5.2.1 has been changed from -975F to -975G.

15. Regarding page 5-1, paragraph 5.2.2(b), specification S-311-200 is imposed for hybrid microcircuits as a function of past experience. For impossible or impractical situations, the Metsat Project considers waivers on a case-by-case basis.

16. Regarding page 5-4, paragraph 5.2.4, for the purposes of this contract, ITT must define the screening and lot conformance testing requirements for new electrical, electronic or electromechanical devices/parts not currently on a grade 1 QPL to GSFC's approval requirements.

17. Page 5-5, paragraph 5.2.6, is replaced with the following paragraph from the spacecraft PAR (GSFC-S-480-26):

    An internal destructive examination shall be performed on a decapped sample of each manufacturing lot or lot-date code of microcircuits, hybrid microcircuits and semiconductors. Destructive physical analysis (DPA) tests, procedures, sample size, and criteria shall be as specified in GSFC Secification S-311-70 (Appendix A). A defect in any of the specimens as defined in S-311-70 shall be cause for lot rejection or a Material Review Board (MRB) action. Contractor DPA procedures and requirements may be used if they have been submitted to Metsat in accordance with the contract.

18. With regard to page 5-5, paragraph 5.4, GSFC encourages the computer generation of lists to make updating and submission easier.

19. Regarding page 5-7, paragraph 5.5, radiation testing may be required. The requirement is that devices used in flight equipment meet their required application. If device susceptibility to radiation or shielding analysis indicates a marginal design, a revised design or testing to assure compliance will be expected.

20. Regarding page 6-1, paragraph 6.2.4, Krytox 143 Lubricant Waiver," Krytox 143 is liquid lubricant which exceeds the outgassing requirement. It should be submitted on the Lubrication List (GSFC Form 18-59C) and not on the Polymeric Materials List (GSFC Form 18-59A). Lubricants are not required to meet the outgassing requirements but their life must exceed the instrument life and they must not contaminate adjacent optical surfaces. A waiver is not required.

21. With regard to page 6-2, paragraph 6.4(b), "Engineering Drawing," engineering drawings are required to be submitted upon GSFC request in order to describe and clarify a few material applications during GSFC materials, processes and lubrication list reviews. Engineering drawings will not be needed for the HIRS and AVHRR reviews because the materials applications are identical to previous instruments and understood by the reviewer.

22. Regarding page 7-1, paragraph 7.2.1, paragraph 5.0, Volume II of MIL-HDBK-338 is adequate to be used by ITT as general design guidelines.

23. Regarding page 7-1, paragraph 7.2.1, for the purposes of this contract, the requirements cited apply to new or changed designs only.

24. With regard to page 7-2, paragraph 7.2.4.1, for purposes of this contract, design specifications shall be written for each item of hardware of the system, subsystem and component level for new or changed designs only. The specification can be formatted according to any accepted engineering practice including MIL-STD-490A or company operating instructions.

25. Regarding page 7-2, paragraph 7.3.1, the FMECAs which were prepared and submitted to GSFC for the previously flown HIRS/AVHRR instruments are considered adequate for the HIRS/3 and AVHRR/3 design as of the date (February 13 - 14, 1990) of the HIRS/3 and AVHRR/3 CDR. FMECAs will be required, however, for interface circuits which are either significantly changed or totally designed after the date of the CDR.

26. Regarding page 7-3, paragraph 7.3.3, the WCAs which were prepared and submitted to GSFC for the previously flown HIRS/AVHRR instruments are considered adequate for the HIRS/3 and AVHRR/3 design as of the date (February 13 - 14, 1990) of the HIRS/3 and AVHRR/3 CDR. WCAs will be required, however, for circuits which are either significantly changed or totally designed after the date of the CDR.

27. With regard to page 7-2, paragraph 7.3.1, since the AVHRR and HIRS designs do not provide redundancy, it shall be understood for the purposes of this contract that the Critical Item List required shall address new or changed designs only. Critical Item Control Plans and Critical Item Test Specifications shall not be required, except as noted in

paragraph 3.2.2.

28. Regarding page 7-3, paragraph 7.3.2, stress analyses performed on previous AVHRR and HIRS instruments shall be updated to include all new or modified circuitry. If a stress analysis does not exist, stress analysis shall only be required for the new designs and their interfaces to demonstrate that acceptable stress levels are obtained.

29. With regard to page 7-3, paragraph 7.3.2, both the GSFC PPL and MIL-STD-975 are acceptable references for parts derating criteria. ITT may use the document that best suites the designer's needs, keeping in mind the mission environment and goals.

30. Regarding page 7-3, paragraph 7-4, 10 years is defined for this contract as the basis for Limited-life items. (See item 9, above).

31. With respect to paragraph 8.15.3.5, "heritage" design circuit boards need not be redesigned to meet the test and inspection criteria of the PAR/PAIP. Only new boards are required to totally meet this criteria. Note: "Heritage" boards which have undergone minor changes to accommodate NOAA-K/L/M shall be treated as "heritage" design circuit boards.

32. With respect to paragraph 8.10.3, the contractor must use the listed NASA Handbooks (NHBs) for new designs. The contractor must have inspection and test procedures which have been reviewed by a government quality representative for all designs (new or heritage).

33. Regarding page 9-1, paragraph 9.0, contamination control must be held at the same control levels that produced the instruments on the previous contract. The procedures used on the AVHRR/2 and HIRS/2 instruments must be submitted to GSFC for review and their brief implementation plan for the AVHRR/3 and HIRS/3 instruments must be submitted to GSFC for approval.

34. With reference to page 10-1, paragraph 10.1, these Software Assurance Requirements apply to this contract to the extent required to support non-flight software. Test software will be maintained under configuration control and changes are subject to Metsat approval. Metsat desires only that limited Quality Assurance be required to ensure compliance with

mutually acceptable standards, and to provide management visibility into the ongoing software development effort.

35. Regarding Page 5-5, paragraph 5.2.6, S-311-70A, rather than 3-311-70, should be used for DPAs.

36. Regarding Page 10-1, paragraph 10.2 shall be added as follows:

10.2 SOFTWARE DEVELOPED BY SUBCONTRACTORS

For all subcontracted software, the contractor shall develop an acceptance test plan and acceptance test procedures which shall be reviewed by a government software quality representative and by Metsat. The acceptance test plan shall list:

a. Each major functional, performance and software requirement.

b. The general tests which will be performed to demonstrate that the software satisfies each requirement.

c. The environment in which each test will be run.

d. The sources of the data for each test.

e. The indication of a successful outcome for each test.

The test procedures shall document:

a. The steps to be followed in running each test in the test plan.

b. The expected results of each test.

The acceptance tests shall be monitored by a government software quality representative and by Metsat.

After any deficiencies determined during testing have been corrected, retesting shall be conducted by the contractor and monitored by the government software quality representative and Metsat.

Contractor software quality personnel shall verify that all test results are fully and accurately recorded with all discrepancies fully documented. The contractor shall

maintain files of the test and retest documentation/results and shall make these files available upon request to either Metsat or a government software quality representative.

37. EEE Parts Control Requirements are changed to a contractor based organization providing selection, procurement, standardization, disposition and approval of EEE parts; therefore, section 5 is replaced in its entirety with the attached new section 5.

Section 7.3.2 reference paragraph 5.2.3" is deleted. Appendix A section 5 (applicable documents) is deleted and replaced with 5.2.2, 311-INST-001, Instructions for EEE Parts Selection, Screening, and Qualifications, Metsat Project Office; 5.2.6, S-311-M-70, GSFC Specification--Construction Analysis of Electronic Parts, Metsat Project Office (in the appropriate columns). Appendix C delete all data in items 11, 12, 13, 14, and 15 and add delete in first column. Add new item 37, Program Approved Parts List, 5.3.1, Upon request, 5, I; and 38, Parts Identification List, 5.3.2, a. 90days ACA, 5, I; b. Update 30 days before Metsat Flight Assurance CDR, 5, R; c.30 days after any change to list, 5, R. Table of Contents is changed to reflect new section 5.

38. Regarding paragraph 8.13.1.3, item c (1) is deleted and replaced with the follows:

(1) Repair—The MRB shall approve repairs except as follows. Standard repair procedures shall be submitted to Metsat in accordance with Appendix C. For each repair, the application of standard repair methods shall require approval from the contractor's Engineering and Product Assurance Group. Each standard repair method shall address number of attempted applications (each instance) that are authorized prior to MRB review. Standard repair methods that have been previously approved by Metsat, shall be changed to incorporate the requirements as specified above, and resubmitted to Metsat for review and approval. The MRB shall ensure that the hardware reliability and quality are not compromised by excessive repairs.

Regarding paragraph 8.13.1.3, item c (3) title is deleted and replaced with the following:

"Use-As-Is—Submit a request in accordance with Appendix C except as follows:"

Regarding paragraph 8.13.1.3, item c (3) the following note is deleted: "Note: The products shall be withheld from further

processing in a controlled area until direction for disposition is given by the contracting officer."

CCR 1612
MOD 143

39. Regarding paragraph 8.13.2.2, item d is deleted and replaced with the following:

d. Government or government authorized quality representative (for failures of flight hardware)

Regarding paragraph 8.13.2.2, second paragraph, last sentence is deleted and replaced with the following:

The FRB chairman, denoting completion of close-out actions for failures of flight hardware and approval of the entire Board, shall sign the malfunction report close-out before submitting it to Metsat in accordance with Appendix C. Failures related to test or support equipment need not be submitted to Metsat and may be closed by the contractor's Failure Review Board, as defined by the contractors Failure Reporting Procedure.

5. PARTS CONTROL REQUIREMENTS

5.1 GENERAL REQUIREMENTS

The contractor shall plan and implement an Electrical, Electronic, and Electromechanical (EEE) Parts Control Program to assure that all parts selected for use in flight hardware meet mission objectives for quality and reliability. The contractor shall prepare a Parts Control Plan (PCP) describing the approach and methodology for implementing the Parts Control Program. The PCP shall be made a part of the proposal for review in accordance with contract delivery requirements.

5.2 ELECTRICAL, ELECTRONIC, AND ELECTROMECHANICAL (EEE) PARTS

All part commodities identified in the GSFC Preferred Parts List (PPL) are considered EEE parts and shall be subjected to the requirements set forth in this section. Custom or advanced technology devices such as custom hybrid microcircuits, detectors, Application Specific Integrated Circuits (ASIC), and Multi-Chip Modules (MCM) shall also be subject to parts control appropriate for the individual technology (see 5.2.2.1).

5.2.1 Parts Control Board

The contractor shall establish a Parts Control Board (PCB) or a similar documented system to facilitate the management, selection, standardization, and control of parts and associated documentation for the duration of the contract. The PCB shall be responsible for the review and approval of all parts for conformance to program requirements, and for developing and maintaining a Program Approved Parts List (PAPL). In addition, the PCB shall be responsible for all parts activities such as failure investigations, disposition of non-conformances, and problem resolutions. PCB operation procedures shall be included as part of the PCP.

5.2.1.1 PCB Meetings--PCB meetings shall be convened on a regular basis or as needed. Meeting minutes or records shall be maintained by the contractor to document all decisions made and a copy provided to GSFC within three days of convening the meeting. GSFC shall retain the right to overturn decisions regarding non-conformances within ten days after receipt of meeting minutes. GSFC may participate in PCB meetings and shall be notified in advance of all upcoming meetings. PCB activities may be audited by GSFC on a periodic basis to assess conformance to the contractor's PCP.

5.2.2.1 Parts Selection and Processing

All parts shall be selected and processed in accordance with the GSFC

311-INST-001 Instructions for EEE Parts Selection, Screening and Qualification. Part quality level shall be Grade 1. All application notes in 311-INST-001 shall apply. Contractor's internal selection and processing documentation may be used if determined by the PCB to be consistent with 311-INST-001 for the specific mission level. Exceptions to 311-INST-001 shall be identified in the PCP.

5.2.2.1 Custom Devices--In addition to applicable requirements of 311-INST-001, any custom microcircuits, hybrid microcircuits, MCM, ASIC, etc. planned for use by the contractor shall be subjected to a design review. The review may be conducted as part of the PCB activity. The design review shall address, at a minimum, derating of elements, method used to assure each element reliability, assembly process and materials, and method for assuring adequate thermal matching of materials.

5.2.3 Derating

All EEE parts shall be used in accordance with the derating guidelines of the PPL. The contractor's derating policy may be used in place of the PPL guidelines and shall be submitted with the PCP.

5.2.4 Radiation Hardness

All parts shall be selected to meet their intended application in the predicted mission radiation environment. The radiation environment consists of two separate effects, those of total ionizing dose and single-event phenomena. The contractor shall document the analysis for each part with respect to both effects.

5.2.5 Verification Testing

Verification of screening or qualification tests are not required unless deemed necessary as indicated by failure history, GIDEP Alerts, or other reliability concerns. If required, testing shall be in accordance with 311-INST-001 as determined by the PCB.

5.2.6 Destructive Physical Analysis

A sample of each lot date code of microcircuits, hybrid microcircuits, and semiconductor devices shall be subjected to a Destructive Physical

Analysis (DPA). All other parts may require a sample DPA if it is deemed necessary as indicated by failure history, GIDEP Alerts, or other reliability concerns.

DPA tests, procedures, sample size and criteria shall be as specified in GSFC specification S-311-M-70, Destructive Physical Analysis. Contractor's procedures for DPA may be used in place of S-311-M-70 and shall be submitted with the PCP. Variation to the DPA sample size requirements, due to part complexity, availability or cost, shall be determined and approved by the PCB on a case-by-case basis.

5.3 PARTS LISTS

The contractor shall create and maintain a Program Approved Parts List (PAPL) and a Parts Identification List (PIL) for the duration of the program. The contractor may choose to incorporate the PAPL and PIL into one list, which shall be submitted to GSFC as a PIL, provided clear distinctions are made as to parts approval status and whether parts are planned for use in flight hardware.

5.3.1 Program Approved Parts List

The Program Approved Parts List (PAPL) shall be the only source of approved parts for flight hardware, and as such may contain parts not actually in flight design. Only parts that have been evaluated and approved by the PCB shall be listed in the PAPL. Parts must be approved for listing on the PAPL before initiation of procurement activity. The criteria for PAPL listing shall be based on 311-INST-001 and as specified herein (see 5.2.2). The PCB shall assure standardization and the maximum use of parts listed in the PAPL. The PAPL and all subsequent revisions shall be available for GSFC review upon request.

5.3.1.1 Parts Approved on Prior Programs--Parts previously approved by GSFC via the contractor s Nonstandard Parts Approval Request (NSPAR) on the preceeding contract for a system similar to the one being procured shall be evaluated by the PCB for continued compliance to current program requirements prior to listing in the PAPL. This shall be accomplished by determining that:

a. No changes have been made to the previously approved NSPAR, Source Control Drawing (SCD) or vendor list.

b. All stipulations cited in the previous NSPAR approval have been implemented on the current flight lot, including performance of any additional testing.

5.3.2 Parts Identification List

As opposed to the PAPL, the Parts Identification List (PIL) shall list all parts planned for use in flight hardware, regardless of their approval status. The initial PIL and subsequent updates shall be submitted to GSFC in accordance with the contract delivery requirements.

5.4 ALERTS

The contractor shall be responsible for reviewing and dispositioning all Government Industry Data Exchange Program (GIDEP) Alerts for applicability to the parts proposed for use. In addition, any NASA Alerts and Advisories provided to the contractor by GSFC shall be reviewed and dispositioned.

38. Regarding paragraph 8.13.1.3, item c(1) is deleted and replaced with the following:

(1) Repair--The MRB shall approve repairs except as follows. Standard repair procedures shall be submitted to Metsat in accordance with Appendix C. For each repair, the application of standard repair methods shall require approval from the contractors Engineering and Product Assurance Group. Each standard repair method shall address number of attempted applications (each instance) that are authorized prior to MRB review. Standard repair methods that have been previously approved by Metsat, shall be changed to incorporate the requirements as specified above, and resubmitted to Metsat for review and approval. The MRB shall ensure that the hardware reliability and quality are not compromised by excessive repairs.

Regarding paragraph 8.13.1.3, item c(3) title is deleted and replaced with the following:

Use-As-Is--Submit a request in accordance with Appendix C except as follows:

Regarding paragraph 8.13.1.3, item c(3) the following note is deleted: “Note: The products shall be withheld from further processing in a controlled area until direction for disposition is given by the contracting officer.”

39. Regarding paragraph 8.13.2.2, item d is deleted and replaced with the following:

d. Government or government authorized quality representative (for failures of flight hardware)

Regarding paragraph 8.13.2.2, second paragraph, last sentence is deleted and replaced with the following:

The FRB chairman, denoting completion of close-out actions for failures of flight hardware and approval of the entire Board, shall sign the malfunction report close-out before submitting it to Metsat in accordance with Appendix C. Failures related to test or support equipment need not be submitted to Metsat and may be closed by the contractor's Failure Review Board, as defined by the contractors Failure Reporting Procedure.